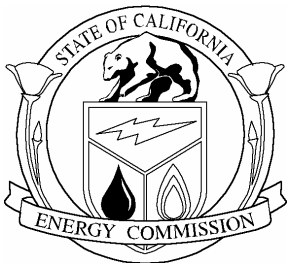
CALIFORNIA
ENERGY
COMMISSION

POTENTIAL APPLIANCE EFFICIENCY REGULATIONS FOR GENERAL SERVICE AND REFLECTOR INCANDESCENT LAMPS AND FOR METAL HALIDE LUMINAIRES

DRAFT STAFF REPORT

July 2005
CEC-400-2005-041-SD



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Background

Since 1975, Section 25402 (c) of the Public Resources Code has required the California Energy Commission ("Energy Commission") to adopt standards for the energy efficiency of appliances. New and upgraded standards must be feasible and attainable, and cannot "result in any added total costs to the consumer over the designed life of the appliance." This added total cost is determined by comparing the costs and performance of a typical model with the proposed standard in effect to a typical model without the proposed standard in effect.

On December 15, 2004, the Energy Commission adopted amendments to the Energy Commission's Appliance Efficiency Regulations (California Code of Regulations, Title 20, Sections 1601-1608). The proposed amendments, known as 15 day language, were published on November 30, 2004, containing two proposals ("Alternative 1" and "Alternative 2") for provisions in 1605.3(k) (2), Table K-3 (Energy Efficiency Standards for State-Regulated General Service Incandescent Lamps), 1605 (k) (3), Table K-4 (Energy Efficiency Standards for State-Regulated Incandescent Reflector Lamps), and 1605.3 (n) (3), Table N-1 (Energy Efficiency Standards for Metal Halide Luminaires).

The Energy Commission decided to adopt Alternative 2. The adoption of Alternative 2 had broad support from affected stakeholders (they were less stringent than Alternative 1), and the Commission wanted the staff to continue working on concerns related to Alternative 1.

The 15 day language, showing Alternatives 1 and 2 for Table K-3 (Standards for State-Regulated General Service Incandescent Lamps), K-4 (Standards for State-Regulated Incandescent Reflector Lamps), and N-1 (Standards for Metal Halide Luminaires) is available on the Energy Commission website at:

http://www.energy.ca.gov/2005publications/CEC-400-2005-012/CEC-400-2005-012.PDF

Directives to the Energy Efficiency Committee

In the *Order Adopting Regulations and Directing Additional Rulemaking Activities* (see: http://www.energy.ca.gov/appliances/2004rulemaking/notices/2004-12-22_ORDER_ADOPT.PDF), the Energy Commission directed the Energy Efficiency Committee to continue this rulemaking to consider possible efficiency standards for full-spectrum or enhanced spectrum general service incandescent lamps. The rulemaking also explored the possibility of making efficiency standards for general service incandescent lamps, incandescent reflector lamps, and non-vertical metal halide luminaires more stringent than those adopted in Alternative 2, and ordered appropriate action to be taken as soon as possible.

The *Order* also said, “"Alternative 1” of the 15-Day Language, which we are not adopting today, contained proposed standards for these types of equipment. Today, we are adopting Alternative 2, which eliminates some of those standards, after discussions with the National Electrical Manufacturers Association (NEMA) and several of its constituent manufacturers. One of the issues [that was] raised concerns the likely responses of consumers to (and thus the likely levels of energy savings from) standards for general service incandescent bulbs. We invite NEMA and its members to discuss actively that issue and other matters associated with the proposed lighting equipment standards listed above, including but not limited to creation, funding, and implementation of a consumer education and marketing program for energy-efficient general service incandescent lamps."

Potential Standards

Since the December 15, 2004 adoption, the Energy Commission staff has discussed these issues with the National Electrical Manufacturers Association (NEMA) and several of its constituent members, *Flex Your Power* staff (California's statewide energy efficiency marketing and outreach campaign; see: http://www.fypower.org/), and the *California Lighting Technology Center* (see: http://cltc.ucdavis.edu/). A revised incandescent lamp study, *Proposed Energy Efficiency Specifications for General Service Incandescent Lamps,* has been written by Ecos Consulting, a consultant for the Pacific Gas and Electric (PG&E) Company.

This report is available on the Energy Commission web site at: http://www.energy.ca.gov/appliances/lamps/documents/2005-06-22_PG+E_PROPOSED_INCANDESCENT.PDF

Based on these follow-up meetings and the additional PG&E study, the Energy Efficiency Committee is considering potential revisions to the Appliance Efficiency Regulations for incandescent lamps and metal halide luminaires as listed on the following pages.

Potential Standards for State-Regulated General Service Incandescent Lamps

"Alternative 2 for Table K-3" (Energy Efficiency Standards for State-Regulated General Service Incandescent Lamps) was adopted by the Energy Commission on December 15, 2004. Alternative 2 included “Tier I” standards to be effective on January 1, 2006 for Frost or Clear and Soft White lamps. "Alternative 1 for Table K-3" was not adopted. Alternative 1 had the same requirements as Alternative 2 and in addition included standards for enhanced spectrum and vibration service lamps, and “Tier II” increased efficiency standards to be effective on January 1, 2007.

The potential standards the Efficiency Committee is considering are shown in Table K-3 on pages 4 and 5. In Table K-3, column 2 shows the standards for January 1, 2006 (Tier I) as adopted by the Commission on December 15, 2004, and column 3 shows the potential standards for January 1, 2008 for State-regulated general service incandescent lamps. The standards for January 1, 2008 (Tier II) are revised from the original proposal in "Alternative 1 for Table K-3" to establish the "Maximum Allowed Wattage (W) as a Function of Lumens (L)." The Tier II standards are equations that apply to specified ranges of lumens.

(k) Lamps (2) Standards for State-Regulated General Service Incandescent Lamps. *The power use of state-regulated general service incandescent lamps manufactured on or after the applicable dates shown in Table K-3 shall be no greater than the applicable values shown in Table K-3.*

Table K-3
Standards for General Service Incandescent Lamps

1		*2*	*3*
Lamp Type		***Maximum Power Use (Watts)***	***Maximum Allowed Wattage (W) as a Function of Lumens (L)***
	Lumens (L)	***January 1, 2006***	***Potential Standards for January 1, 2008***
Frost or Clear	$L \leq 400$	(0.0500 * Lumens) + 21 [The standards in this column were adopted by the Energy Commission on December 15, 2004.]	$W = \frac{35}{400}L$
	$400 < L \leq 550$		$W = 38.5$
	$550 < L \leq 700$		$W = \frac{19}{150}(L - 700) + 57.5$
	$700 < L \leq 950$		$W = 57.5$
	$950 < L \leq 1050$		$W = \frac{3}{25}(L - 1050) + 70$
	$1050 < L \leq 1250$		$W = 70$
	$1250 < L \leq 1450$		$W = \frac{1}{8}(L - 1450) + 95$
	$1450 < L \leq 1900$		$W = 95$
	$1900 < L \leq 2400$		$W = \frac{17}{200}(L - 2400) + 137.5$
	$2400 < L \leq 2800$		$W = 137.5$
	$2800 < L$		$W = \frac{97}{2000}(L - 3000) + 143.8$
Soft White	$L \leq 350$	(0.0480 * Lumens) + 23 [The standards in this column were adopted by the Energy Commission on December 15, 2004.]	$W = \frac{37}{350}L$
	$350 < L \leq 500$		$W = 37$
	$500 < L \leq 750$		$W = \frac{20}{250}(L - 750) + 57$
	$750 < L \leq 900$		$W = 57$
	$900 < L \leq 1050$		$W = \frac{13}{150}(L - 1050) + 70$
	$1050 < L \leq 1200$		$W = 70$
	$1200 < L \leq 1550$		$W = \frac{25}{350}(L - 1550) + 95$
	$1500 < L \leq 1700$		$W = 95$
	$1700 < L \leq 2600$		$W = \frac{50}{900}(L - 2600) + 145$
	$2600 < L \leq 2750$		$W = 145$
	$2750 < L$		$W = \frac{145}{2750}L$

Table K-3 (continued from previous page)
Standards for General Service Incandescent Lamps

1		*2*	*3*
Lamp Type		***Maximum Power Use (Watts)***	***Maximum Allowed Wattage (W) as a Function of Lumens (L)***
	Lumens (L)	***January 1, 2006***	***Potential Standards for January 1, 2008***
Enhanced Spectrum	$L \leq 350$	No Requirement	$W = \frac{7}{60}(L - 350) + 37.5$
	$350 < L \leq 475$		$W = 37.5$
	$475 < L \leq 600$		$W = \frac{4}{25}(L - 600) + 57.5$
	$600 < L \leq 700$		$W = 57.5$
	$700 < L \leq 800$		$W = \frac{3}{20}(L - 800) + 72.5$
	$800 < L \leq 1100$		$W = 72.5$
	$1100 < L \leq 1200$		$W = \frac{9}{40}(L - 1200) + 95$
	$1200 < L \leq 1300$		$W = 95$
	$1300 < L$		$W = \frac{2}{15}(L - 1450) + 115$

Graphic presentations of the Table K-3 equations

The equations for column 3 of Table K-3 are shown graphically as the "Ecos Tier II Proposal" in Figures 1, 2 and 3 on the pages 7, 8 and 9 of this report. These graphics were taken from the *Proposed Energy Efficiency Specifications for General Service Incandescent Lamps*, which is available on the Energy Commission web site at:

http://www.energy.ca.gov/appliances/lamps/documents/2005-06-22_PG+E_PROPOSED_INCANDESCENT.PDF

Figure 1: Frost or Clear Bulbs

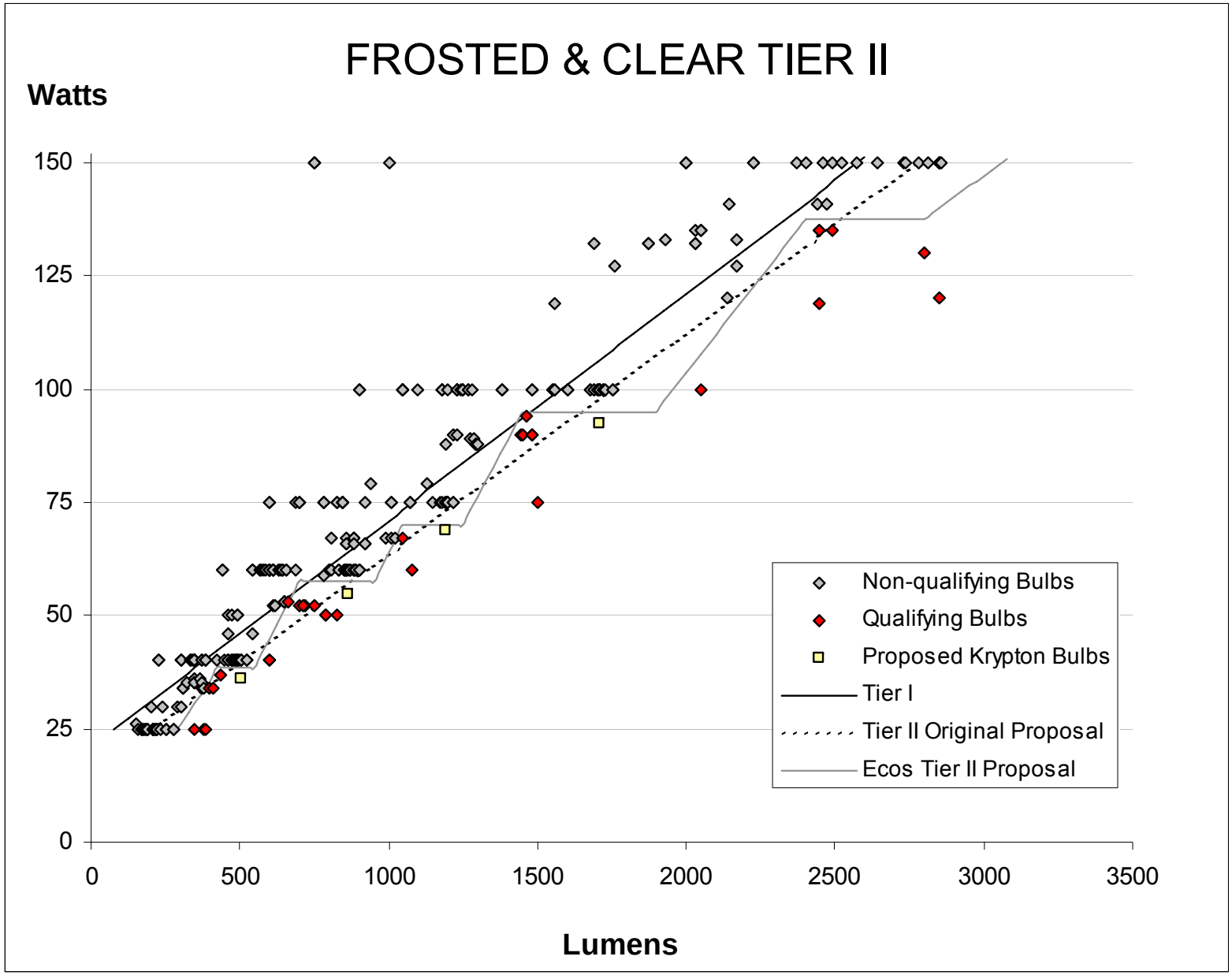


Figure 2: Soft White Light Bulbs

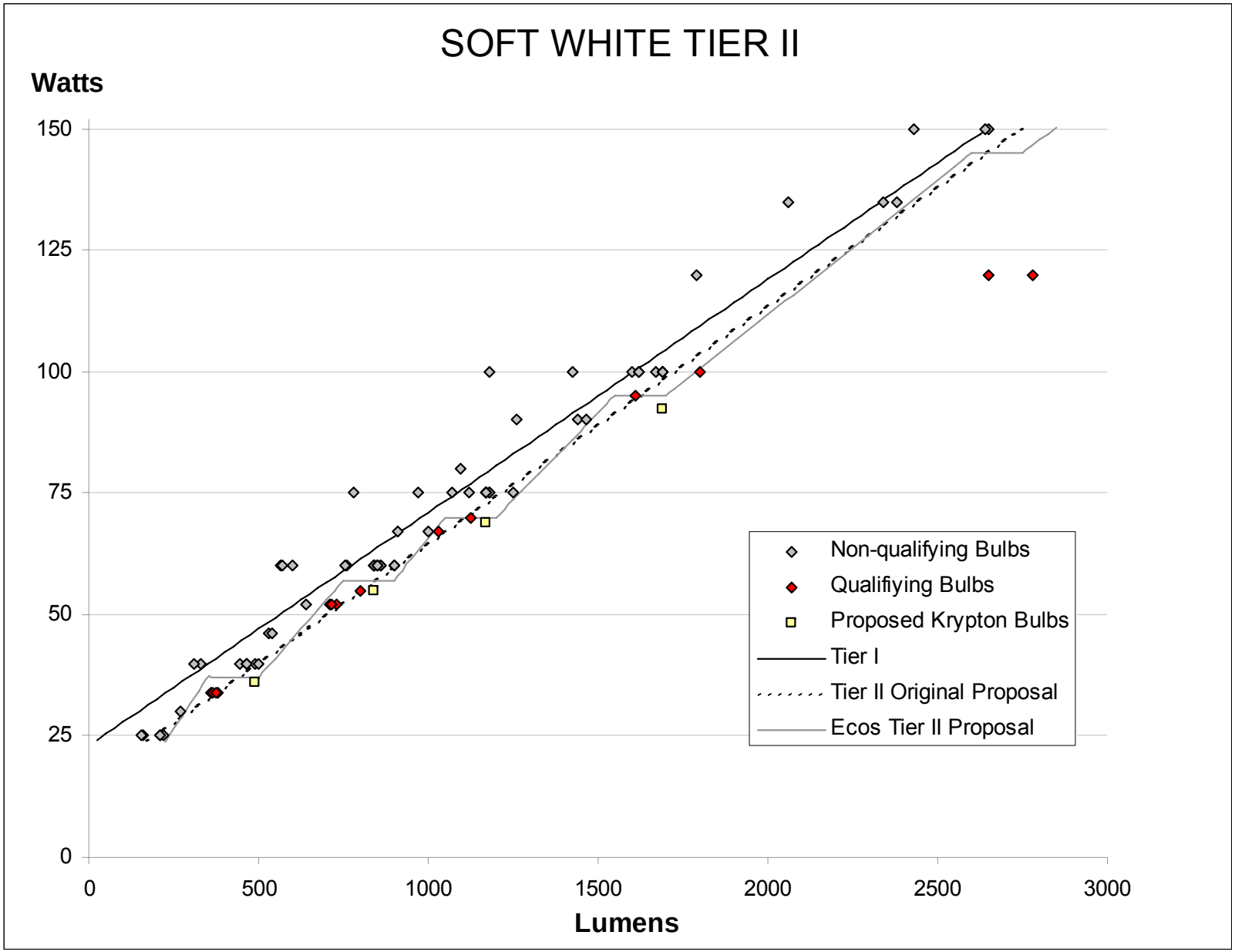
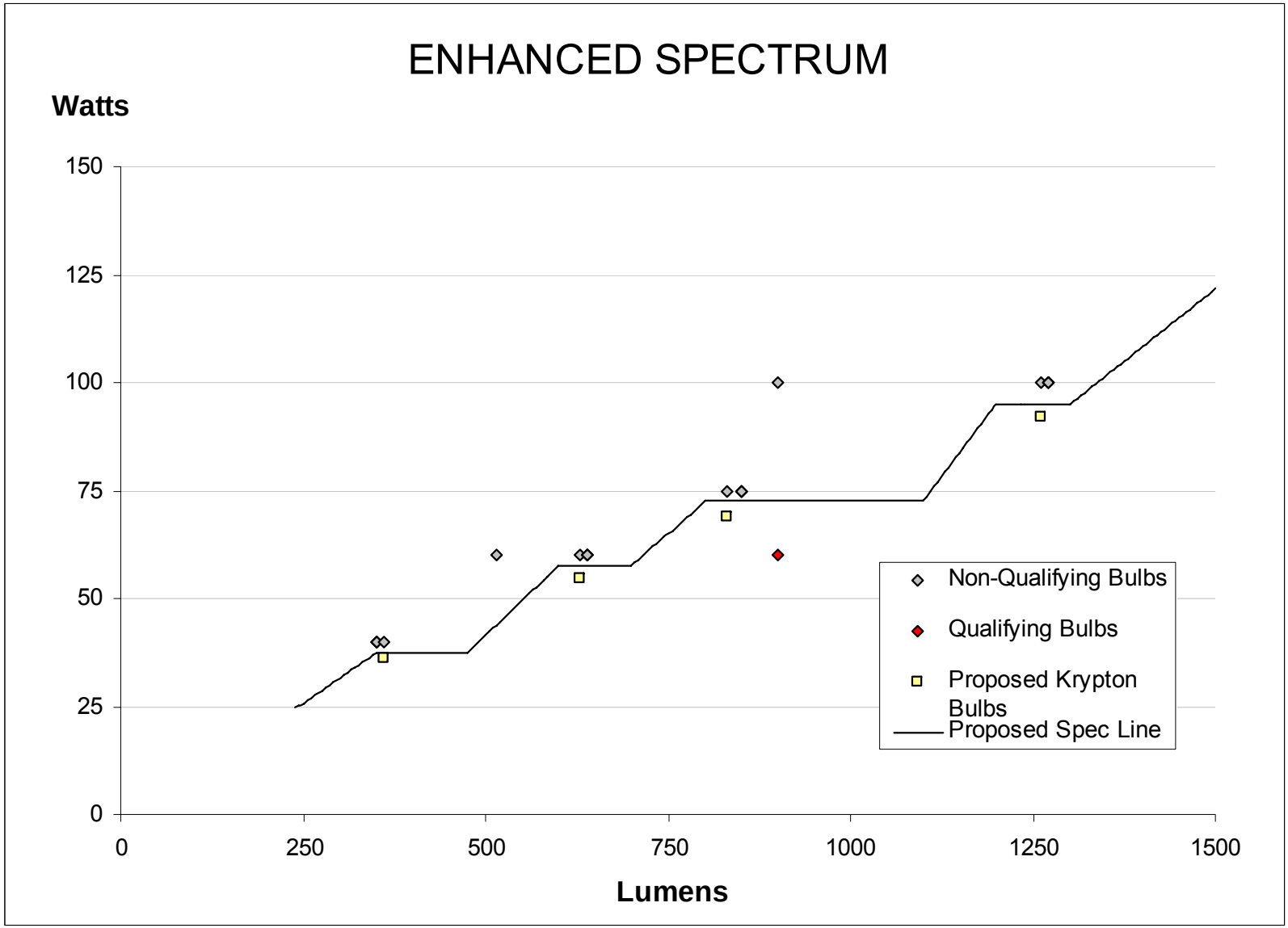


Figure 3: Enhanced Spectrum Light Bulbs



Potential Standards for State-Regulated Incandescent Reflector Lamps

"Alternative 2 for Table K-4" (Energy Efficiency Standards for State-Regulated Incandescent Reflector Lamps) was adopted by the Energy Commission on December 15, 2004. Alternative 2 deleted Table K-4 as it was shown in Alternative 1; thus new standards were not adopted for state-regulated incandescent reflector lamps.

The potential standards the Energy Efficiency Committee is considering are shown in Table K-4 below. Table K-4 shows the standards for reflector lamps as originally proposed in "Alternative 1 for Table K-4," except for the following changes: 1) the effective date is delayed from January 1, 2006 to January 1, 2007, 2) the lowest wattage lamp in the table is changed from 40 to 41 watts, and 3) 50ER30 lamps are exempted.

(K) Lamps (3) Standards for State-Regulated Incandescent Reflector Lamps. *The average lamp efficacy of state-regulated incandescent reflector lamps manufactured on or after January 1, 2007 shall be not less than the applicable values shown in Table K-4.*

EXEMPTION: 50ER30 (50 watt ellipsoidal reflector, 3.75" diameter) lamps.

Table K-4
Standards for State-Regulated Incandescent Reflector Lamps

Rated Lamp Wattage	***Minimum Average Lamp Efficacy (LPW)***
41-50	*10.5*
51-66	*11.0*
67-85	*12.5*
86-115	*14.0*
116-155	*14.5*
156-205	*15.0*

Potential Standards for Metal Halide Luminaires

"Alternative 2 for Table N-1" (Energy Efficiency Standards for Metal Halide Luminaires) was adopted by the Energy Commission on December 15, 2004. Alternative 2 included only “Tier I” standards for metal halide luminaires designed for 150 to 500 watt vertically mounted lamps, to be effective on January 1, 2006. "Alternative 1 for Table N-1" was not adopted. Alternative 1 had the same requirements as Alternative 2, and in addition included standards for metal halide luminaires designed for 150 to 500 watt horizontally mounted lamps, to be effective on January 1, 2008, and “Tier II” increased efficiency requirements for all lamp orientations, to be effective on January 1, 2008.

The potential standards the Energy Efficiency Committee is considering are shown in Table N-1 on page 12. Table N-1 shows the requirement for metal-halide luminaries that disallows probe-start ballasts for vertical lamps on January 1, 2006 as adopted by the Commission on December 15, 2004. In addition Table N-1 shows the requirement that disallows probe-start ballasts for non-vertical lamps on January 1, 2008, which is the same as the original proposal in the "Alternative 1 for Table N-1." Also, the requirement for minimum lamp/ballast efficiency originally proposed in the "Alternative 1 for Table N-1" is separated into two wattage categories, with the requirement for 150-200 watts going into effect on January 1, 2008 as proposed in Alternative 1, and the requirement for 201-500 watts being delayed one year to have an effective date of January 1, 2009.

(n)(2) Energy Efficiency Standard for Metal Halide Luminaires. *Metal halide luminaires, manufactured on or after the effective dates shown in Table N-1, shall meet the requirements shown in Table N-1.*

Table N-1
Standards for Metal Halide Luminaires

Lamp Position	***Lamp Rating***	***Effective Date***	***Requirements***
Vertical	*150-500 Watts*	*January 1, 2006*	*Luminaires shall not contain a probe-start metal halide ballast [adopted 12/15/04].*
All	*150-500 Watts*	*January 1, 2008*	*Luminaires shall not contain a probe-start metal halide ballast.*
All	*150-200 Watts*	*January 1, 2008*	*Luminaires (except "exempted outdoor luminaries" and luminaries operating at 480V) shall contain a metal halide ballast with minimum lamp/ballast system efficiency = (0.0002*Lamp Watts)+0.864*
All	*201-500 Watts*	*January 1, 2009*	*Luminaires (except "exempted outdoor luminaries" and luminaries operating at 480V) shall contain a metal halide ballast with minimum lamp/ballast system efficiency = (0.0002*Lamp Watts)+0.864*

Notes: Fixtures are covered if they are capable of operating lamps that fall within the range of included lamp wattages. Vertical includes both base-up and base-down products. Vertical includes products rated for use within 150 ^{o} of vertical.